

Applicant: Pekka Linnonmaa et al.
PCT App. No.: PCT/FI2005/050076
Preliminary amendment filed September 7, 2006

Claim Listing

1–30. (cancelled)

31. (new) A method for producing calendered paper by means of an off-line calender, in which method a paper web manufactured and moistened in a paper machine and reeled on a machine reel is calendered in a multinip calender arranged apart from the paper machine, said paper web (W) being moistened with at least one premoisturizer before the multinip calender and said multinip calender being formed of rolls having a flexible coating and heated rolls placed alternately against each other in such a manner that a nip is formed between successive rolls,

wherein

the paper web is calendered in the multinip calender whose roll assembly is formed of a first set of rolls and a second set of rolls in the travel direction of the paper web;

at least one surface of the paper web is moistened with the at least one pre-moisturizer, whereafter the paper web is passed to the first calender nip of the first set of rolls and the other surface of the paper web is moistened with at least one intermediate moisturizer, whereafter the paper web is guided to the first calender nip of the second set of rolls; and that

the at least one pre-moisturizer and the at least one intermediate moisturizer are positioned in the travel direction of the paper web on the opposite sides of the web in such a manner that the absorption time of the moistening medium sprayed by at least one pre-moisturizer and intermediate moisturizer on the opposite surfaces of the paper web is substantially the same, wherein as a result of calendering a paper web having roughness of 1.0–1. 1 μm and/or gloss of 54–57 % or 56–60 % is produced.

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32. (new) The method according to claim 31, wherein one surface of the paper web is moistened before the paper web is passed to the first calender nip of the first set of rolls, and the opposite surface of the paper web is moistened before the paper web is guided to the first calender nip of the second set of rolls.

33. (new) The method according to claim 31, wherein both surfaces of the paper web are moistened before the paper web is guided to the first calender nip of the first set of rolls, and one surface of the paper web is moistened before the paper web is passed to the first calender nip of the second set of rolls.

34. (new) The method according to claim 31, wherein at least one surface of the paper web is moistened when the paper web is supported against a supporting roll or a guide roll.

35. (new) The method according to claim 31, wherein at least one surface of the paper web is moistened when the paper web travels in a free draw.

36. (new) The method according to claim 31, wherein the paper web is guided to the first calender nip of the first set of rolls and to the first calender nip of the second set of rolls, which calender nips are arranged in such a manner that the surface of the paper web moistened by means of at least one pre-moisturizer and/or intermediate moisturizer is pressed against the heated roll in the nip.

37. (new) The method according to claim 31, wherein the paper web is calendered in the multinip calender in which the first set of rolls and the second set of rolls are arranged in separate stacks of rolls.

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38. (new) The method according to claim 31, wherein the paper web is calendered in the multinip calender in which the first set of rolls and the second set of rolls are arranged successively in a way that they share one roll nip.

39. (new) The method according to claim 31, wherein the moistening of the paper web and the multinip calender are controlled by means of a control unit.

40. (new) The method according to claim 39, wherein the moisture content of the paper web is measured and the supply of moistening medium of at least one pre-moisturizer and/or intermediate moisturizer is adjusted on the basis of a control signal determined from the moisture data of the paper web.

41. (new) The method according to claim 39, wherein the moisture content and/or gloss of the paper web are/is measured and the nip pressures of the nips of the multinip calender and the temperature of the heated rolls are adjusted on the basis of a control signal determined from the moisture and gloss data of the paper web.

42. (new) The method according to claim 31, wherein the paper grade to be calendered is selected from the following group: SC-A, SC-A+ or SC-B.

43. (new) The method according to claim 42, wherein SC-A or SC-A+ paper is calendered, wherein the multinip calender is formed in such a manner that the first set of rolls and the second set of rolls comprise four nips or the first set of rolls and the second set of rolls comprise five nips.

44. (new) The method according to claim 42, wherein SC-B paper is calendered, wherein the multinip calender is formed in such a manner that the first set of rolls and the second set of rolls comprise five nips.

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45. (new) An apparatus for producing calendered paper by means of an off-line calender, said apparatus comprising:

an unwinder for unwinding a paper web produced and moistened in a paper machine and reeled on a machine reel;

a multinip calender formed of rolls having a flexible coating and heated rolls placed alternately against each other in such a manner that a nip is formed between successive rolls;

at least one pre-moisturizer for moisturizing at least one surface of the paper web before the multinip calender;

at least one guide roll;

a reel-up for reeling up the calendered paper web;

wherein

the rolls having a flexible coating and the heated rolls forming the multinip calender are arranged in such a manner that they form a first set of rolls and a second set of rolls in the travel direction of the web;

the at least one pre-moisturizer is arranged to moisten at least one surface of the paper web before guiding the paper web to the first calender nip of the first set of rolls; and that

the apparatus comprises at least one intermediate moisturizer for moistening the other surface of the paper web before guiding the paper web to the first calender nip of the second set of rolls; and

the at least one pre-moisturizer and the at least one intermediate moisturizer are positioned in the travel direction of the paper web on the opposite sides of the web in such a manner that the absorption time of the moistening medium sprayed by at least one pre-moisturizer and intermediate moisturizer on the opposite surfaces of the paper web is substantially the same, wherein the roughness of the paper web produced as a result of calendering is 1.0 - 1.1 μm and/or the gloss is 54–57 % or 56–60 %.

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46. (new) The apparatus according to claim 45, wherein at least one pre-moisturizer is arranged to moisten one surface of the paper web before the paper web is passed to the first calender nip of the first set of rolls, and at least one intermediate moisturizer is arranged to moisten the opposite surface of the paper web before the paper web is passed to the first calender nip of the second set of rolls.

47. (new) The apparatus according to claim 45, wherein at least one pre-moisturizer is arranged to moisten both surfaces of the paper web before the paper web is passed to the first calender nip of the first set of rolls, and at least one intermediate moisturizer is arranged to moisten one surface of the paper web before the paper web is passed to the first calender nip of the second set of rolls.

48. (new) The apparatus according to claim 45, wherein the apparatus comprises at least one supporting roll and that at least one surface of the paper web is arranged to be moistened when the paper web is supported against a supporting roll or a guide roll.

49. (new) The apparatus according to claim 45, wherein at least one surface of the paper web is arranged to be moistened when the paper web travels in a free draw.

50. (new) The apparatus according to claim 45, wherein the first calender nip of the first set of rolls and the first calender nip of the second set of rolls are arranged in such a manner that the surface of the paper web moistened by means of at least one pre-moisturizer and/or intermediate moisturizer is pressed against the heated roll in the nip.

51. (new) The apparatus according to claim 45, wherein the first set of rolls and the second set of rolls are arranged in separate stacks of rolls.

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52. (new) The apparatus according to claim 45, wherein the first set of rolls and the second set of rolls are arranged successively so that they share one roll nip.

53. (new) The apparatus according to claim 45, wherein the apparatus comprises a control unit for controlling the moistening of the paper web and the multinip calender.

54. (new) The apparatus according to claim 53, wherein the apparatus comprises measurement devices for measuring the moisture content of the paper web and that the control unit is arranged to determine a control signal from the moisture data of the paper web for adjusting the supply of moistening medium of at least one pre-moisturizer and/or intermediate moisturizer.

55. (new) The apparatus according to claim 53, wherein the apparatus comprises a measurement device for measuring the moisture and/or gloss of the paper web and that the control unit is arranged to determine a control signal from the moisture and gloss data of the paper web to adjust the nip pressures of the nips of the multinip calender and the temperature of the heated rolls.

56. (new) The apparatus according to claim 45, wherein the apparatus is arranged to calender a paper grade selected from the following group: SC-A, SC-A+ or SC-B.

57. (new) The apparatus according to claim 56, wherein the apparatus is arranged to calender SC-A or SC-A+ paper, wherein the multinip calender is formed in such a manner that the first set of rolls and the second set of rolls comprise four nips or the first set of rolls and the second set of rolls comprise five nips.

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58. (new) The apparatus according to claim 56, wherein the apparatus is arranged to calender SC-B paper, wherein the multinip calender is formed in such a manner that the first set of rolls and the second set of rolls comprise five nips.